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ABSTRACT

The foundations of the cognitive developmental curriculum movement are briefly examined in the paper. The key features of this movement are the recommendations it makes in three areas: curriculum sequencing, curriculum content, and teaching strategies. Each of these areas is critically examined. It is concluded that the grounds for all proposals are purely theoretical. When the data are considered they either contradict specific proposals or provide no direct evidence. (Author/MS)

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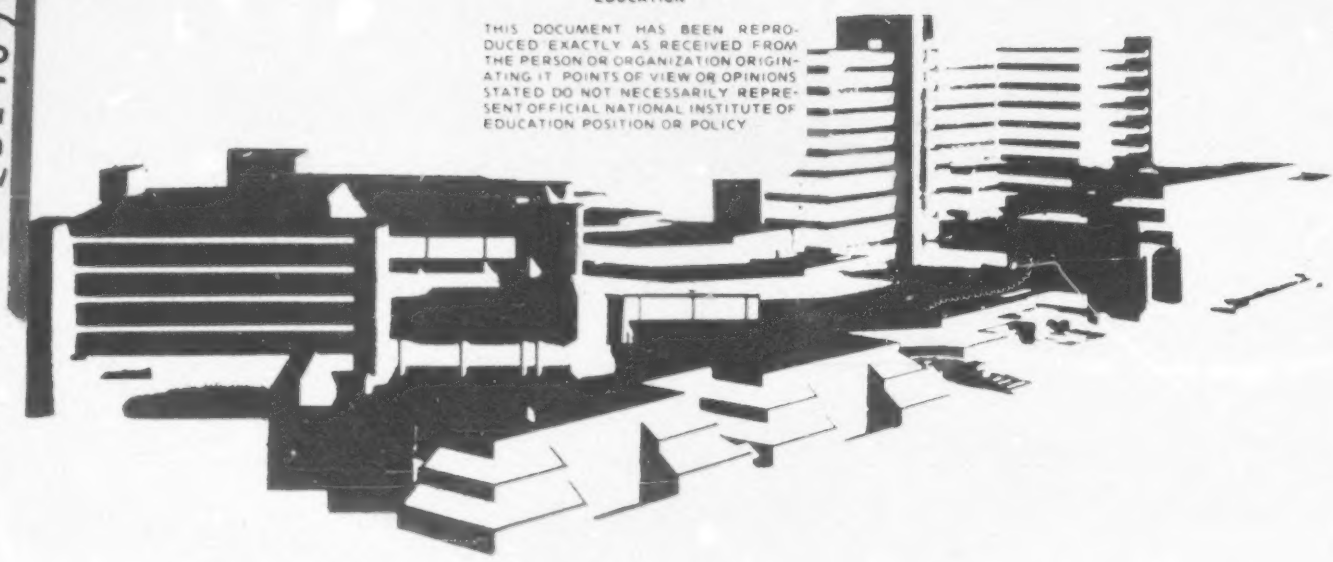

COGNITIVE DEVELOPMENT AND INSTRUCTIONAL THEORY[1]

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Abstract

The foundations of the cognitive-developmental curriculum movement are briefly examined in this paper. The key features of this movement are the recommendations it makes in three areas: curriculum sequencing, curriculum content, and teaching strategies. Each of these areas is critically examined. It is concluded that the grounds for all proposals are purely theoretical. When the data are considered, they either contradict specific proposals or provide no direct evidence.

Traditionally, the study of cognitive development has been more intimately concerned with the theory and practice of instruction than most other areas of research on behavioral development. There are, of course, sound reasons for the relationship. One of these is that instruction inevitably deals with intelligence, broadly defined. Another is the fact that the rise of the modern intelligence testing movement, at the turn of the century in France and Great Britain, was precipitated by an instructional motive, namely, the need to identify children who probably would not benefit from the curricula of the day. But let us not delve into history--at least not yet.

What I should like to do in this paper is to examine the principal implications of modern cognitive-developmental theory, especially Piaget's work, for instructional theory. I intend that this examination should be critical. Judging from recent papers on instructional ramifications of cognitive-developmental theory, there appears to be wide-spread consensus that the theory leads to specific prescriptions and proscriptions when it comes to teaching children. Indeed many of these recommendations have already been incorporated by a new generation of experimental preschool curricula: the so-called "cognitive" curricula (for reviews, see Brainerd, in press-a, chapter 7; Hooper & De Frain, 1974; Lawton & Hooper, in press). I shall mention some of them presently. For the moment, the point I wish to emphasize is this. Although the advent of such curricula has been accompanied by tremendous amounts of hyperbole as to their presumed merits, we actually know very little about the effects of cognitive developmentally based instruction. What are the facts? Are there any rational grounds, apart from the ex cathedra statements made by some theory, that would lead a prudent person to suppose that implementation of cognitive-developmental recommendations

should produce better learning in children? I shall argue that the answer to this question is no. Before doing so, however, I should perhaps says how I first came to be interested in the question.

As a developmental researcher, my ignorance of instructional matters is profound. About all I have to go on, other than common sense, are my experiences as a university teacher. I had always intended that my ignorance should remain a permanent condition. But two projects, that were originally undertaken for quite different reasons, necessitated an end to this state of bliss. While reviewing the available literature on cognitive developmentally oriented curricula, I discovered two facts--the first comforting and the second disquieting. To begin with, I found that the most thoughtful writers in the field--the Hoopers, the Sigels, and so on--all seemed to agree that cognitive-developmental theory makes some unambiguous recommendations about instruction. What is more, the recommendations seemed to fall into three distinct categories: (a) proposals about the sequencing of curriculum material; (b) proposals about the content of curriculum material; (c) proposals about the methodology of teaching children. These recommendations are incorporated, with varying degrees of exactness, by the four best-known experimental curricula in the area: the Lavatelli (1970, 1971) Early Childhood Curriculum; the Weikart (e.g., 1973) Open Framework Program; the Wisconsin Piaget Preschool Education Program (e.g., Bingham-Newman, Saunders, & Hooper, 1974); the Kamii Piaget for Early Education Program (e.g., Kamii & DeVries, 1974).

It was nice to see that experts could agree on something. However, I also discovered that the empirical reasons for including this or that instructional recommendation in this or that curriculum were always exceedingly thin.

In fact, they were more or less nonexistent. The only rationale for adopting recommendations that is consistently cited in the aforementioned programs is that some theory, usually Piaget's, says you should. Since it has been my experience that infallibility is somewhat scarce among cognitive-developmental theorists, the lack of empirical grounds for doing certain things in certain ways struck me as alarming.

In what remains of this paper, I shall attempt to bridge the gap between fact and recommendation. Given space constraints, it is clear that I shall not be able to do a very good job. About all that I shall be able to accomplish is to state some of the problems and suggest directions in which solutions may be found. It is hoped that these remarks, though woefully incomplete, will stimulate readers interested in the cognitive-development curriculum movement to look into it more deeply.

Theoretical Proposals

Let us begin by considering the three areas in which instructional recommendations have been made--sequencing, content, and methodology. Taking sequencing first, the recommendations in this category are statements that, in earlier years, would probably have been called readiness proposals. When all the recondite theoretical terms ("structure," "equilibration," "assimilation," etc.) are pared away, cognitive-developmental theory seems to be a conventional readiness approach to children's learning (Brainerd, 1977a). To establish this point, it is sufficient to recall Piaget's remark that "teaching children concepts that they have not acquired in their spontaneous development ... is completely useless" (Piaget, 1970, p. 30). Readiness statements of this sort, though familiar to all of us, are notoriously slippery. Part of the

difficulty is that they turn out to be circular if we do not possess independent measures of "learning" and "readiness to learn," which we almost never do. All too frequently, therefore, such statements simply obscure the question that really needs to be answered: Why is it that, given identical training, some children learn and others do not? The answer that some children are ready to learn and others are not may be a comforting article of faith, but it is hardly an explanation.

The sequence category contains four specific curriculum recommendations (cf. Brainerd, in press-a, chapter 7). First and foremost, we should never try to teach children concepts that are beyond their current stage of cognitive development. This may be regarded as one of the two most important tenants of cognitive-developmental curricula. (The other, active self-discovery instruction, is discussed later.) Piaget's concrete-operational stage provides several convenient examples. The theory says that most of the concepts taught in beginning arithmetic--sets, cardinal numbers, addition, correspondence, and so on--belong to this stage. The grades during which these concepts normally are introduced, first and second, are believed to contain a mixture of concrete-operational children and children functioning at the immediately preceding stage (preoperations). According to the theory, only the former are ready to begin learning the basic elements of arithmetic. Teaching these concepts to preoperational children is, in Piaget's words, "completely useless."

The second sequencing recommendation is entirely negative. Teachers should never attempt to accelerate their pupils' progress through a given subject matter. The theory says that rate of progress is a function of development, and it is bad to speed up mother nature (see also Brainerd, in press-b).

In place of acceleration, teachers are told to aim for comprehensive mastery of each topic in the curriculum. The third sequencing recommendation is the one to which this category of proposals owes its name. The theory says that children should be taught concepts in the same order in which the concepts are known to appear during spontaneous cognitive development. ("Spontaneous," like "readiness," is a slippery term, but we shall ignore this problem.) Again, Piaget's concrete-operational stage is the standard source of illustrations. Since the early 1960s, arithmetic programs in North America have included large amounts of material on set theory. Most of the concepts of elementary set theory--classification, extension, intension, and so on--just happen to belong to the concrete-operational stage. Consequently, their "spontaneous development" has been studied by Piaget (e.g., Inhelder & Piaget, 1964), and normative findings about their order of emergence have been reported. According to the theory, this ordering should dictate the order in which the concepts are introduced in the classroom.

The last sequencing recommendation is far and away the most controversial of the four. If children cannot and should not be taught concepts that exceed their current stage of cognitive development, our hands are tied unless we know something about each child's stage. In other words, we must somehow assess children's stages. This implies that teaching becomes a two-step process wherein we first diagnose a child's stage and then tailor instruction to conform to our diagnosis. Thus, the cognitive-developmental teacher becomes equal parts diagnostician and instructor. I said that this recommendation is controversial. There are two reasons. First, existing teacher training programs at major universities expose students to a panoply of pedagogical skills but few diagnostic skills. Second and more important,

there is the matter of cost-benefit trade off. The diagnostic recommedation entails that cognitive-developmental instruction will be highly personalized. Some writers have even claimed, perhaps facetiously, that there should be one teacher for each pupil. In any case, everyone agrees that the costs involved in implementing the recommendation would be staggering. Large and demonstrable improvements in learning would appear to be the only justification for such costs.

We now take up the second area of curriculum recommendations, namely, proposals about content. Most of these proposals deal with mathematics, especially arithmetic and geometry. Piaget's concrete-operational stage continues to be our source of illustrations. Piaget's work on this stage contains a wealth of examples of things that are not now taught in elementary school mathematics programs but easily could be taught if we wished to do so. Consider logic and geometry. With the advent of the new math, most of the basic concepts of the logic of class (set theory) are now being taught to elementary schoolers. But the logic of relations is largely ignored. There are relational concepts which, according to the theory, could be taught during elementary school. They include transitive inference, seriation, multiple seriation, and ordinal number. Similar recommendations have been made regarding geometry (e.g. Sigel, 1969). The theory says that the familiar concepts of Euclidean geometry (distance, measurement, etc.) and projective geometry (rotation, translation, etc.) belong to the concrete-operational stage. Therefore, we could theoretically teach both Euclidean and projective geometry during elementary school--especially in grades three to six when most pupils are ostensibly concrete-operational. We could teach topological geometry even earlier. Topological concepts are supposed to belong to the preoperational

stage. A thorough implementation of these recommendations about geometry would mean that by tne time children leave elementary school, they would have had at least some exposure to notions now confined to high school and college.

Another type of content recommendation deals with what sorts of materials should be used to teach children concepts. There are two key prescriptions: (a) materials should be as concrete as possible (e.g., real objects and pictures) and (b) they should be as action-oriented as possible. Proposal a follows from the theory's assumption that, before adolescence, children are incapable of learning things at an abstract, linguistic level. It follows that teaching concepts by merely using words or mathematical expressions will not work very well with elementary schoolers. The other prescription, that materials should be action-based, follows from the hypothesis that intelligence is rooted in motor activity rather than, say, language or imagery. To teach classification, for example, it is recommended that children practice sorting small collections into mutually exclusive classes. In teaching simple physical concepts such as length and weight, it is recommended that children spend considerable time measuring objects and weighing them. Since thinking is believed to evolve from motor activity, manipulative learning materials of this sort are a must in cognitive-developmental curricula. If the theory is correct, the learning produced by such materials should be better than that which results when children are simply told something (tutorial learning) or shown something (observational learning).

Finally, let us turn to proposals about the methodology of instruction. This is the category where the theory seems to hit its stride and generate several unequivocal recommendations. All extant cognitive-developmental

curricula incorporate lengthy lists of teaching dos and don'ts (e.g., see Kamii, 1973b). The items in these lists vary from one program to another. In general, the longer the list, the more doctrinaire its author. There are, however, three items that seem to be included in all lists. First, teachers are continually reminded that the child's role in the process of instruction is more critical than the teacher's and, consequently, learning must call for active involvement on the part of the child. It is impossible for me to convey to you the zeal and enthusiasm with which cognitive-developmental writers exhort teachers to rely on active self-discovery as a learning strategy (cf. Duckworth, 1964; Kamii, 1973a, 1973b). It is equally difficult for me to convey the dark and dangerous consequences which are said to issue from curricula that do not make use of such strategies. Unfortunately, however, cognitive-developmental writers rarely present empirical evidence for either of these views. The standard technique is simply to regale the reader with numerous shortcomings of traditional teaching methods and then present active self-discovery as an alternative approach (e.g., Kamii, 1973a, 1973b).

A second methodological recommendation is that teachers should try to make children aware of conflicts and inconsistencies in their reasoning. We might call this "conflict teaching" or "dissonance teaching," where the conflicts in question are intellectual rather than emotional. Basically, conflict teaching consists of trying to induce children to learn new things by showing them how these new things conflict with things they already believe. The classic example cited by most writers involves cardinal number. Suppose we wish to teach pupils that the cardinal number of a set is invariant under groups of symmetry transformations (rotation, reflection, translation, and so on). Research (e.g., Piaget, 1952) has shown that young children think

that such transformations do not leave cardinal number invariant. To teach the concept of cardinal invariance, we might pair a child who has the concept with one who does not. We would then present a series of tasks in which sets containing various numbers of things undergo symmetry transformations. After each transformation, we ask the children to state whether or not cardinal number has remained invariant and to give reasons for their statements. Presumably, the two children will offer different rationales. It is said that the child who thinks symmetry transformations alter cardinal number will eventually notice the inconsistencies between his own line of reasoning and the other child's. This, in turn, produces intellectual reorganization and an eventual understanding of cardinal invariance (see also Brainerd, in press-b, for further examples). The grounds for conflict teaching originate in the hypothesis that cognitive development is a matter of attaining and losing equilibrium. That is, it consists of periods of relative intellectual stability interspersed with periods of instability.

A third methodological recommendation is that, where possible, the child's peers should be his teachers. The role of social interaction in cognitive development was stressed in one of Piaget's earliest works (Piaget, 1926). This particular work dealt with language rather than intelligence. However, it is usually interpreted as implying that social interaction serves an important function in all cognitive acquisitions. It is also believed that peer interaction teaching can be defended on the basis of the first two methodological recommendations. After all, it is obviously an active form of learning. Further, peer interactions are likely to foster conflicts of opinion among children.

It is apparent that the third methodological recommendation leads to an emphasis on small group activities in cognitive-developmental curricula. Insofar as teaching strategies are concerned, it generates something strongly resembling committee work. Children are assigned to small discussion groups and work is given to groups as a whole. The groups are told to do their work together rather than solitarily. They are encouraged to debate different answers thoroughly and to arrive at a group consensus as to the validity of specific answers. Although it is hoped that discussion groups will arrive at the correct answers to given questions, they are cautioned against riding rough shod over minority opinions. Teachers are explicitly excluded from playing any formative role in a discussion groups' deliberations. While teachers may be discussion leaders or organizers, their opinions cannot be used as a basis for arriving at a group consensus. It is argued that children's debates will not be uninhibited if teachers play more active roles.

Analysis

Up to this point, I have endeavored to state cognitive-developmental proposals without comment. Now, it is time to take up some criticisms. It is my hope that these criticisms will be viewed as constructive by advocates of cognitive-developmental curricula. Since these curricula currently enjoy considerable popularity, we would indeed be remiss if we failed to concern ourselves with their apparent limitations. Let us go over the three categories--sequencing, content, and methodology--in the same order as before.

The first sequencing recommendation was that we should not try to teach children things that are beyond their current stage of cognitive de-

velopment. This statement begs an important question. What is a stage of cognitive development? One of the great weaknesses of cognitive-developmental theory is that, on the one hand, it tells us that intellectual growth proceeds through an invariant sequence of stages but, on the other hand, it does not tell us how to recognize a stage when we see one. Recent analyses of the stage construct (Brainerd, 1976a, 1977a; Brainerd & Siegler, in press) suggest that there is no such thing as stage of cognitive development. By this, I mean that recent analyses have indicated that the notion has no significance apart from specific behaviors. Therefore, when I say that there is no such thing as a stage of cognitive development I am not making an ontological claim; rather, I simply mean that the weight of evidence favors the view that "stage" is a purely descriptive term. Although cognitive-developmental theory attempts to explain the appearance of specific behaviors (e.g., conservation, classification, seriation) on the ground that children have reached a certain stage of development, the fact remains that there is no way to measure cognitive stages independently of the behaviors they profess to explain (for demonstrations, see Brainerd 1977a; Brainerd & Siegler, in press). Hence, stages cannot be used to explain the behaviors associated with them on pain of circularity. Of course, theorists such as Piaget (e.g., 1960) have proposed certain criteria which, they say, are capable of establishing the existence of stages independently of behavior. But it is not difficult to show that such criteria--e.g., structure, invariant sequence, integration--are themselves nothing more than descriptions of behavior (Brainerd & Siegler, in press).

In short, there appears to be no extant evidence which would convince a prudent reader that the phrase "cognitive stage" does anything other than

describe behaviors that undergo age change. Insofar as we are able to say, the concrete-operational stage, for example, means behaviors such as conservation, transitivity, etc. and nothing more. The fact that stages are purely descriptive terms has devastating consequences for the first sequencing recommendation. Since stage and behavior are the same thing, what the recommendation actually says is this: We should avoid teaching children concepts that they do not already possess. If this statement were to be taken seriously, one wonders what the point of instruction would be. To avoid straying any further from the main theme, I shall assume that it is not to be taken seriously. Nevertheless, the statement highlights a profound dilemma that confronts advocates of cognitive-developmental curricula. Although the aim of instruction is to instruct, we always must wait until the child learns something about a given idea, presumably from informal sources in his environment. Since the usual social rationale for "formal education" is to improve on the unreliability of such informal sources, this appears to be a paradoxical implication.

The second and third sequencing recommendations were appeals for mastery teaching and for teaching concepts in the same order in which children acquire them in everyday life. It is hard to argue with either proposal. Mastery is laudable. Since the notion of order of acquisition in everyday life implies some sort of order of complexity, it also seems reasonable to rely on normative data to make decisions about the order in which topics should be introduced. Although both recommendations seem appropriate, an important point to bear in mind is that our reasons for viewing them favorably have nothing to do with cognitive-developmental theory. The mastery emphasis could be considered unique to cognitive-developmental theory only if it happened that traditional curricula rush children pell-mell through topics. They do not. Historically, I believe

that gifted children are the only group for which rapid acceleration has been widely advocated. Also, the sequencing emphasis could be considered unique to cognitive-developmental theory only if it were not stressed in traditional curricula. In fact, as we all know, this is one of the oldest issues in curriculum design.

The fourth sequencing recommendation is that we should attempt to diagnose each child's stage of cognitive development. This recommendation is difficult to countenance for the same reasons as the first. If it is true that cognitive stages are merely descriptive terms, then there are no stages to diagnose. All we can do is measure specific behaviors which the stages purportedly explain (but actually do not). This will certainly identify concepts that children do and do not possess. But this does not help us much. Curiously, we are not allowed, by virtue of the first recommendation, to teach the latter items, because teaching things that children do not already grasp is "completely useless." Common sense suggests that this is precisely where instruction should be concentrated. However, the theory only permits us to amplify previously acquired ideas.

I shall now leave sequencing recommendations and return to the earlier proposals about content. Recall that there were two types of proposals, one regarding the use of concrete-manipulative materials and the other regarding new things that children might be taught if we wished to do so. Leaving the question of manipulation aside for the moment, I think there can be little doubt as to the merits of concrete materials. Attention is a crucial variable in children's learning (e.g., Fisher & Zeaman, 1973; Zeaman & House, 1963). The attentional advantages of colorfully illustrated textbooks and tangible objects over symbols are, I should think, obvious. However, notice

that our reasons for viewing this recommendation favorably again have nothing to do with cognitive-developmental theory. The second half of the concrete-manipulative recommendation, that the best instructional materials are ones which children can physically handle, lacks empirical confirmation. It is true that the theory provides grounds for this proposal in the form of its assumption that human thinking is rooted in motor behavior. But this is only an assumption, and I know of no set of experimental findings that provides clear support for it. On the contrary, learning researchers have been able to produce excellent improvement in the conceptual skills that lie at the heart of the theory--most notably, conservation--with procedures that are completely nonmanipulative. Among the more successful of these nonmanipulative procedures are observational learning (e.g., Rosenthal & Zimmerman, 1972; Zimmerman & Rosenthal, 1974), rule instruction (e.g., Beilin, 1965; Hamel & Riksen, 1973), attentional set (e.g., Gelman, 1969), conformity (e.g., Murray, 1972; Botvin & Murray, 1975), and simple judgment-contingent feedback (e.g., Brainerd, 1976b, 1977b). Since the findings generated by manipulative procedures have been compared to those generated by nonmanipulative procedures elsewhere (Brainerd, in press-b), I shall not reprise the comparison here. Instead, I shall only note the main conclusions. First, there was no evidence that manipulative treatments produce superior learning. Second, where comparison was possible, nonmanipulative procedures seemed to produce more substantial learning effects than manipulative procedures. Since manipulative experiments published to date suffer from a variety of methodological anomalies (e.g., small numbers of subjects, nonreplicable training trials), both conclusions should be regarded as tenative. However, given that our purpose is to decide whether there are any solid grounds for cognitive-developmental curriculum proposals, the following conclusion

about the first content recommendation is appropriate: While it may be true, probably for attentional reasons, that concreteness is an important advantage in teaching materials, there is no solid reason to suppose that motor activity is critical.

The second content proposal was concerned with certain topics in the areas of logic and geometry that could conceivably be introduced in elementary school mathematics programs. Some of them are things which are not taught (e.g., logic of relations), and others are things which are currently introduced much later (e.g., Euclidean geometry). Here, there are two points to be made. The first and most obvious one is that the decision to teach this or that topic is not a matter of theory. It is, or at least it should be, a matter of social policy based on our best information about what people need to know to get on in the world. However, advocates of cognitive-developmental curricula almost invariably interpret the theory's statement that we could teach certain things as mandating that they should be taught. For example, considerable stress is placed on teaching topological geometry in Piagetian preschool curricula because the theory says that topological concepts belong to the preoperational stage. But no thought is given to why they should be taught or to the thorny question of whether they may be supplanting other things that should be taught. The second point is that the theory is probably wrong when it proposes that most geometrical skills are within the capacities of most elementary schoolers. Euclidean geometry provides a rich source of illustrations. It is true that Piaget has claimed that all basic Euclidean concepts are worked out during the elementary schoool years (Piaget & Inhelder, 1956; Piaget, Inhelder, & Szeminska, 1960). Research has not borne out this claim. Most Euclidean concepts, when they are grasped

at all, do not seem to emerge before adolescence. Some of them apparently are never understood by a majority of adults. The concept of horizontality is a good example. Piaget, Inhelder, and Szeminska (1960) reported that horizontality is understood by most 9-year-olds. Subsequent normative research has shown that not even a majority of college students have this concept. Data pertaining to concrete-operational concepts that, given the present stage of our knowledge, seem to be beyond the reach of elementary schoolers are reviewed in Brainerd (in press-a, chapter 5).

Finally, we come to the matter of methodological proposals. This is the place where, I suspect, the adherents to cognitive-developmental curricula will disagree most sharply with my observations. Although this is unfortunate, I do not believe it is avoidable. It will be remembered that there were three specific proposals about instructional methodology (use active self-discovery teaching, use conflict teaching, and use the child's peers as teachers), one of which is advocated with much passion and eloquence. However, I know of no findings in the literature on children's concept learning which tend to support any of them. The available data appear to be predominately negative on the first two and, at best, ambiguous on the third.

With regard to the use of active self-discovery, there has now been a modest amount of research in which such procedures are used to train concepts from Piaget's concrete-operational stage. Although a few of these studies have been conducted by investigators outside Geneva, most of the work has been done by Piaget's collaborators. The best single source of facts is a recent book by Inhelder, Sinclair, and Bovet (1974). The findings of these and related experiments have been reviewed elsewhere (Brainerd, in press-b). When active learning experiments were compared to experiments

using other procedures, the review revealed two weaknesses in the former procedures. First, from a purely quantitative standpoint, active self-discovery has failed to produce as much learning as familiar nonactive treatments such as feedback, observational learning, and rule instruction. Second, it does not seem to work at all with children below a certain age level. To illustrate, in a series of conservation training experiments reported by Inhelder, Sinclair, and Bovet (1974) active self-discovery repeatedly failed to produce any improvement in subjects who did not satisfy two additional criteria: (a) a prior understanding of one or more conservation concepts and (b) older than age 5. Procedures such as feedback, observational learning, rule instruction, etc. suffer from neither of these weaknesses. They have consistently produced conservation learning in subjects with no prior knowledge of the concept (cf. Brainerd, in press-b). They have also produced conservation learning in children age 5 and below (cf. Brainerd, 1977a). The implication of these facts for the first methodological recommendation is clear. If traditional learning strategies work better than active ones, even with Piaget's own concepts, why should we seek to replace them with active procedures?

The merits of conflict teaching and peer teaching are also open to doubt. Concerning conflict teaching, this proposal, as we saw, is said to follow from the hypothesis that cognitive development is a dissonance-like process. In line with this hypothesis, a good deal of work was done with conflict learning in the early days of neoPiagetian training research (see Flavell, 1963). The best known of these early conflict treatments is Smedslund's prediction-outcome method. It was observed that training of this sort did not work particularly well (Strauss, 1972). Although this

conclusion requires qualification (see Brainerd, 1973), it is fair to say that the learning effects produced by prediction-outcome conflict were less substantial than those produced by other methods mentioned above. I would add that, in the classroom, conflict teaching has a hitherto unmentioned flaw--it can almost never be used. This claim may seem astounding, but I assure you it is not. For conflict teaching to work at all, it is clear that children must possess certain beliefs which run counter to whatever it is we are trying to teach them. There are some special cases, notably those involving arithmetic discussed earlier, in which contradictory beliefs will be held by most children. But surely these cases are exceptional. I submit that children have no opinion one way or the other about the great preponderance of things they learn in school. Most of the information they encounter in subjects such as geography, hygiene, communication skills, history, and so on are novel. To illustrate this flaw in the conflict approach, consider two things that most of us learned in elementary school, namely, Columbus set sail for the New World in 1492 and "sheep" is the plural of "sheep." Try to imagine a conflict method of teaching either of these things. More generally, try to imagine how conflict teaching could be implemented for teaching English, social studies, geography, and civics.

Concerning the use of peers as teachers, there are simply too few data available at present on which to base a rational conclusion. Some experiments have been published in recent years wherein peer interaction has been used to train conservation. Most of this work has been done by Frank Murray (e.g., 1972; Botvin & Murray, 1975). In line with cognitive-developmental theory, peer interaction has generated solid learning effects in Murray's experiments. So far, however, there is nothing in the data which could be

interpreted as showing that peer interaction works better than other procedures. In the only study I know of in which factorial comparisons were made (Botvin & Murray, 1975), peer interaction proved to be a slightly less effective training procedure than simple imitation. Another qualification that must be placed on peer interaction experiments is the age of their subject samples. Earlier I noted that Genevan active training methods are not known to produce learning in children younger than age six. The same may be said of peer interaction. To date, Murray's experiments have focused exclusively on subject samples with mean ages greater than six. The effectiveness of peer interaction with subjects age five and below is, therefore, yet to be established. By comparison, it is already known that methods such as feedback, imitation, and rule instruction are effective with younger subjects.

Addendum

I have tried to present what might be termed a case study in the pitfalls of adopting instructional policies on the ground that cognitive-developmental theory (or any other theory for that matter) says that we should. It would be rash to believe that these remarks will produce sweeping changes in the behavior of those who advocate cognitive-developmental curricula. However, I would hope that some of the points raised above might encourage readers who incline in the direction of such curricula to take a hard look at their premises.

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